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**Attachments:** F RPP Parcel G\_2019\_01\_08.doc

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All,

Attached is the Redline FINAL RPP for Parcel G. Please complete a final review of the document prior to January 14, 2019. All of your comments should be incorporated to date (pending ROICC's final approval of additional comments submitted on 1/3/2019).

If you have any questions please let me know.

Very Respectfully,

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**FINAL**  
**RADIATION PROTECTION PLAN**

Radiological Investigation, Survey, and Reporting  
Parcel G

FORMER HUNTERS POINT NAVAL SHIPYARD  
SAN FRANCISCO, CALIFORNIA

January 2019



Naval Facilities Engineering Command Southwest  
BRAC PMO West  
San Diego, CA

## **FINAL RADIATION PROTECTION PLAN**

Radiological Investigation, Survey, and Reporting  
Parcel G

FORMER HUNTERS POINT NAVAL SHIPYARD  
SAN FRANCISCO, CALIFORNIA

January 2019

Prepared for:



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Contract Number: N62473-17-D-0006; Task Order: N6247318F5065  
DCN: APTM-0006-5065-0008

# Radiation Protection Plan

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Project Number: Contract Task Order—N62473-18-F-5065

Date Effective: January 2019

The primary objective of this contract task order is to demonstrate to the U.S. Environmental Protection Agency, the California Department of Toxic Substance Control, the California Department of Public Health, and public stakeholders that human health impacts from radionuclides of concern at Parcel G are within acceptable levels and the Radiological Unrestricted Reuse Recommendation designations can be reinstated for the sanitary sewer/storm drain excavation areas and former building sites, enabling Parcel G to be transferred to the City of San Francisco for redevelopment. This Radiation Protection Plan is applicable to radiation safety support of the following Former Hunters Point Naval Shipyard Parcel G radiological investigation, survey and reporting activities:

1. Excavate former sanitary sewer/storm drain trench units and collect characterization and confirmation soil samples
2. Conduct radiological scanning and/or sampling of all excavated soil to determine appropriate reuse (backfill or disposal)
3. Investigate sanitary sewer/storm drain trench units by radiological surface surveys and collection of subsurface samples
4. Conduct radiological surveys of former building sites and building crawl space
5. Conduct non-low-level radiological waste characterization and off-site transportation and disposal
6. Additional work tasks as directed by the U.S. Department of the Navy
7. Work will be performed under Nuclear Regulatory Commission License 20-31340-01 and California State Radiological License 7889-07

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## Acronyms and Abbreviations

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ALARA	as low as reasonably achievable
AMS	<i>APTIM Management System</i>
APP/SSHP	<i>Accident Prevention Plan, Radiological Investigation, Survey, and Reporting, Parcel G, Former Hunters Point Naval Shipyard, San Francisco, California</i>
APTIM	APTIM Federal Services, LLC
CDPH	California Department of Public Health
CFR	Code of Federal Regulations
DOT	U.S. Department of Transportation
HPNS	Hunters Point Naval Shipyard
MOU	memorandum of understanding
mrem	millirem
Navy	U. S. Department of the Navy
NRC	U.S. Nuclear Regulatory Commission
PM	project manager
PPE	personal protective equipment
PRSO	Project Radiation Safety Officer
QC	quality control
RCS	Radiological Control Supervisor
RCT	Radiological Control Technician
RML	Radioactive Material License
ROC	radionuclide of concern
RPP	radiation protection plan
RSO	Radiation Safety Officer
RWP	radiological work permit
SOP	standard operating procedure
Triple A	Triple A Machine Shop, Inc.
TtEC	Tetra Tech EC
WP	<i>Parcel G Removal Site Evaluation Work Plan, Former Hunters Point Naval Shipyard, San Francisco, California</i>
WP Addendum	<i>Parcel G Removal Site Evaluation Work Plan Addendum, Former Hunters Point Naval Shipyard, San Francisco, California</i>

# 1.0 INTRODUCTION

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This Radiation Protection Plan (RPP) is provided to detail the Aptim Federal Services, LLC (APTIM) requirements for activities conducted under Radioactive Material License (RML) No. 20-31340-01 and State of California RML 7889-07, issued and subject to regulatory enforcement by the U.S. Nuclear Regulatory Commission (NRC) and the California Department of Public Health (CDPH), respectively (Appendix A). Figures 1 and 2 show the locations of the work site. Overall guidance for conducting the investigations at Parcel G, Hunters Point Naval Shipyard (HPNS), San Francisco, California is contained in the *Parcel G Removal Site Evaluation Work Plan, Former Hunters Point Naval Shipyard, San Francisco, California* (WP; CH2M, 2018) and the *Parcel G Removal Site Evaluation Work Plan Addendum, Former Hunters Point Naval Shipyard, San Francisco, California* (WP Addendum; APTIM, 2018a).

This RPP describes elements of *APTIM Management System* (AMS; APTIM, 2018b) procedure AMS-710-07-PR-04000, “Radiation Safety Program,” applicable to this work. References to applicable standard operating procedures (SOPs) are provided in the applicable sections. APTIM procedure SPL-SOP-8.10, “Radiation Protection Program,” requires the preparation of this site-specific RPP for activities involving the possession, use of, or work with materials with the potential for exposure to ionizing radiation. This RPP complies with APTIM policies and procedural requirements and provides the overall guidance to project management and personnel to execute the project scope of work in a manner that protects workers, the public, and the environment. Table 1 provides regulatory agency contact information. This RPP describes APTIM procedures governing site-specific development and radiation-protection-program-implementation requirements. Table 2 lists these procedures. Additional work instructions may be prepared for task-specific work activities.

## 1.1 Radiological Operations Identified at Parcel G

Originally, the 98 acres designated as Parcel D located in the central portion of HPNS were part of the industrial support area and were used for shipping, ship repair, and office and commercial activities. Parcel D was divided in July 2008 into Parcel D-1, Parcel D-2, Parcel UC-1, and Parcel G. In addition, a small area perpendicular to H Street was added to Parcel G so that the property boundary extended straight along H Street. The purpose of the Parcel D division into four separate parcels was to support the potential early transfer of Parcel G to the City and County of San Francisco (Tetra Tech EC, Inc [TtEC], 2011).

Approximately 40 acres in area, Parcel G extends from Spear Avenue on the north, to Morrell Street on the east, to Manseau Street on the south, and to H Street on the west (Figure 2). It is bounded on the north by Parcel UC-1, on the east by Parcels C and D-1, on the south by Parcels D-1 and E, and on the west by Parcel E. Radiologically-impacted Buildings 351, 351A, 366, 401, 408, 411, 439, and the Former Buildings 317/364/365 Site are located within the boundaries of Parcel G (TtEC, 2011).

Parcel G consists of relatively flat lowlands with surface elevations between zero and 10 feet above mean sea level. These lowlands were constructed of borrowed fill material from various sources. The sources of the fill material included crushed serpentinite bedrock from the adjacent hills and dredged sediments. The serpentinite bedrock and bedrock-derived fill material consist of naturally occurring minerals including asbestos, arsenic, manganese, nickel, and other metals. The geology of Parcel G generally consists of artificial fill and undifferentiated sands over Bay Mud over coast-range bedrock. The majority of the Parcel G ground surface is covered with buildings and pavement. No threatened or endangered species are known to inhabit Parcel G and there is no viable terrestrial habitat (TtEC, 2011).

The U. S. Department of the Navy (Navy) used HPNS starting in 1939 for shipbuilding, repair, and maintenance, including decontamination of ships used in nuclear weapons testing. HPNS was deactivated in 1974. Between 1976 and 1986, the Navy leased most of HPNS to a private ship repair company, Triple A Machine Shop, Inc. (Triple A). During the lease period, Triple A used dry docks, berths, machine shops, power plants, various offices, and warehouses to repair commercial and Navy vessels. During its occupancy of HPNS, Triple A allegedly disposed of hazardous materials at various locations at HPNS. Parcel G was formerly used for industrial support that included office and commercial activities such as shipping and ship repair (Arcadis U.S., Inc., 2014). As a result of the historical radiological operations at HPNS, storm drains, sanitary sewer lines, soil, and debris have indicated the presence of low-level radioactive contamination.

The primary radionuclides of concern (ROCs) known or suspected within Parcel G are radium-226, cesium-137, and strontium-90. Plutonium-239 is also a ROC for the former Buildings 317/364/365 site only. Specific Parcel G work activities, including soil screening, are addressed in the WP (CH2M, 2018) and WP Addendum (APTIM, 2018a).

The primary ROCs exist as constituents of the natural background. Radium-226 for example has been measured in non-impacted San Francisco Bay Area locations at 1.3 picocuries per gram. Data from HPNS indicate environmental cesium-137 levels up to 1.161 picocuries per gram; those levels were measured before additions attributable to the accident at Fukushima, Japan. Background radiation also includes naturally occurring radioactive materials (NORM), which includes alpha-, beta-, gamma-, and neutron emitting radionuclides.

The NRC defines background in Code of Federal Regulations (CFR), Title 10, Part 20.1003:

*Background radiation* means radiation from cosmic sources; naturally occurring radioactive material, including radon (except as a decay product of source or special nuclear material); and global fallout as it exists in the environment from the testing of nuclear explosive devices or from past nuclear accidents such as Chernobyl that contribute to background radiation and are not under the control of the licensee. “*Background radiation*” does not include radiation from source, byproduct, or special nuclear materials regulated by the Commission.

## 2.0 RADIATION PROTECTION PERSONNEL

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Personnel involved with radiological work at Parcel G are required to follow this RPP. Appendix B provides the personnel acknowledgement form used for each project. The following subsections provides additional roles and responsibilities. Table 3 lists key radiation protection personnel.

### 2.1 License Radiation Safety Officer

The License Radiation Safety Officer (RSO) is responsible for implementing the APTIM NRC and California RMLs, including communications to the NRC or CDPH, when required, and identifying and training qualified authorized users. Implementation responsibilities include identifying and assigning the Project Radiation Safety Officer (PRSO) and other authorized users, reviewing and approving this RPP, coordinating investigation of radiological occurrence, and reviewing and approving the corrective action plan addressing causes identified for a radiological occurrence. The License RSO also performs and documents a review of compliance with this RPP annually, at a minimum. The License RSO is also responsible for ensuring compliance with applicable regulatory requirements for radiation protection of the workers, public, and environment. When license activities at a site end, the License RSO notifies the NRC and/or CDPH in writing within 30 days of the termination of activities.

### 2.2 Radiological Operations Manager

The Radiological Operations Manager is responsible for radiation protection staffing and providing technical direction and guidance on implementation of this RPP. The Radiological Operations Manager may assume some or all of the duties assigned to the PRSO, as required.

### 2.3 Project Radiation Safety Officer

The PRSO is the individual assigned to implement this RPP at Parcel G, HPNS. The PRSO, or his/her designee, is authorized by the License RSO and is named as an authorized user on NRC RML 20-31340-01 and California RML 7889-07. Whenever radiological work is performed, the PRSO or designee is present at the project site. The PRSO is responsible for the following:

- Acting as primary interface with regulators during site inspections
- Correcting identified deficiencies in the allotted time frame
- Preparing and maintaining this RPP
- Implementing the as low as reasonably achievable (ALARA) principle in radiological work
- Identifying and obtaining appropriate instrumentation, protective devices, dosimetry, and other items needed to perform work in accordance with elements of this RPP
- Providing radiological worker training
- Reviewing and approving radiological work permits (RWPs)

- Maintaining communication with the Project Manager (PM) and License RSO, as needed, to ensure that this RPP is fully implemented
- Assessing the proper operation of radiation measuring equipment, including the performance of daily operational and quality control (QC) checks, and verifying out-of-compliance instruments are removed from service
- Overseeing and assessing the performance of radiological surveys and sampling in accordance with this RPP, APTIM SOPs, and site-specific work instructions
- Ensuring survey findings and instrument performance data are reviewed for accuracy, completeness, and compliance with project, procedural, and regulatory requirements
- Ensuring work is performed in accordance with this RPP, project plans, and applicable RWPs
- Participating in periodic internal and external reviews of RPP content and implementation
- Performing and supporting self-assessments and management reviews
- Preparing and maintaining reports and notices as required by this RPP and as requested by the Navy
- Ensuring that data records are properly managed, secured, and stored
- Maintaining a safety conscious work environment, with radiation safety as the primary focus

The PRSO reports to and receives license compliance direction from the License RSO, advises the PM on radiation protection and radiological operation matters, and coordinates with the PM on day-to-day project activities. The PRSO also communicates and coordinates radiation protection and radiological operation activities with the License RSO, Navy, CDPH, and/or NRC, as appropriate.

## 2.4 Project Manager

The PM is responsible for ensuring the following:

- Work is conducted safely and in compliance with applicable permits, client contracts, and other applicable controlling documents
- Adequate resources and staffing are available to develop and implement this RPP in compliance with applicable regulations and requirements, and empowered to complete the project safely in all facets, including radiological safety

## 2.5 Construction Manager

The Construction Manager is responsible for the following:

- Assurance that personnel under their direction comply with radiological requirements, including applicable site-specific procedures, training requirements, and RWPs and verbal instructions provided by radiological control personnel

- Provide on-going and timely information to the PRSO about projected work activities
- Immediate notification to the PRSO and PM of radiological problems or issues encountered
- Assurance that workers have successfully completed required training to perform assigned duties and that necessary tools and equipment are available to minimize the amount of time spent in radiologically posted areas
- Assurance that escorted visitors are supervised while in a radiologically-controlled area and that visitors maintain safe work practices in accordance with the written instructions or as directed by the PRSO or designee

The Construction Manager reports to the PM.

## 2.6 Radiological Control Supervisor

The Radiological Control Supervisor (RCS) is the APTIM individual assigned to supervise the Radiological Control Technicians (RCTs) and oversee daily radiological operations. The RCS may serve as the PRSO's designee with documented License RSO approval. The RCS is responsible for the following:

- Acting as first point of contact when regulators arrive on the project site
- Preparing and implementing RWPs, per requirements of site-specific work instructions
- Supervising the proper use and management of radiation measuring equipment, including the performance of daily operational and QC checks, and verifying out-of-compliance instruments are removed from service
- Directing and supervising the performance of radiological surveys and sampling in accordance with this RPP, survey plans, and APTIM SOPs
- Reviewing survey findings and instrument performance data for accuracy, completeness, and compliance with project, procedural, and regulatory requirements
- Assigning and supervising the performance of radiological surveys and sampling in accordance with this RPP, APTIM SOPs, and site-specific work instructions
- Participating in periodic internal and external reviews of RPP content and implementation and supporting self-assessments and management reviews
- Correcting identified deficiencies, per the corrective action plan or at the direction of the PRSO, in the allotted time frame
- Maintaining communication with the PM, License RSO, and PRSO as needed to fully implement this RPP

The RCS reports to and receives technical direction from the PRSO.

## 2.7 Radiological Control Technicians

RCTs may be APTIM or subcontract employees. The RCTs are responsible for the following:

- Performing work in compliance with this RPP, SOPs, and applicable site-specific work instructions
- Supporting the RCS in the preparation of RWPs, as needed
- Providing radiation safety oversight of employees working in radiologically-controlled areas
- Providing RWP briefings and ensuring RWP requirements are followed during authorized work activities
- Performing radiological surveys, investigations, sampling, decontamination, and job coverage, per the requirements of the work instructions and as directed by the RCS and PRSO
- Properly using and maintaining radiation safety instrumentation and equipment
- Posting radiologically-controlled areas and labeling radioactive material per the requirements of the site-specific work instruction
- Ensuring that radioactive material is properly labeled, stored and secured when not in use
- Stopping work when radiological conditions are changing or are unknown
- Keeping the RCS and PRSO informed of site radiological conditions

The RCTs report to and receive technical direction from the RCS and/or PRSO.

## 2.8 Radiation Workers

Radiation workers (radiologically-trained general labor force) performing work in radiologically-controlled areas are expected to:

- Successfully complete required radiation safety training
- Safely perform assigned work activities per the requirements of the applicable RWP or as directed by RCT, RCS, or PRSO
- Immediately report lost dosimetry devices to the RCT
- Report medical radiation treatments to direct supervisor and the RCS and/or PRSO prior to returning to work or wearing dosimetry
- Notify the RCT of potentially unsafe radiological conditions or concerns with personal protective equipment (PPE) or radiation monitoring equipment

Radiation workers report to the Construction Manager and receive direction from the Project Supervisors for non-radiological requirements and the RCT for radiation safety requirements.





## 3.0 RADIATION PROTECTION PLAN ASSESSMENT AND AUDIT

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To assure compliance and evaluate implementation of this RPP, QC measures including self-assessment and management reviews are employed.

### 3.1 Self-Assessment, Reviews, and Corrective Actions

Quarterly self-assessments and management reviews include evaluation of exposure rates present during excavation, radiological monitoring data, and efficacy of established radiological work practices, ALARA practices, and use and effectiveness of PPE. Additional management reviews should be performed at four- to six-week intervals. Results of self-assessments and management reviews are reported to and reviewed for concurrence by the License RSO.

Deficiencies identified during self-assessment, management review, or an audit must be tracked and corrected. At a minimum, a corrective action plan is developed and approved by the License RSO. Completion of corrective actions must be documented, verified, and approved as implemented to close the self-assessment or management review. Findings resulting from an audit require a formal response that includes identification of the root cause, immediate action(s) taken to correct the nonconforming condition, the corrective action proposed or taken to prevent a recurrence, and the schedule for completion of corrective action(s). Responses to findings must be submitted to the License RSO for review and approval. Information regarding notification and reporting can be found in AMS-710-07-WI-04020, "Radiation Safety Incident Notification and Improvement Reporting." AMS-710-07-FM-40201, "Radiological Improvement Report," is used to document an occurrence that is a clear violation of applicable federal, state, corporate, or project regulations or procedures.

Unplanned exposures, internal uptakes, personnel skin or personal clothing contamination, personnel injuries (with radiological significance), or deficiency or finding resulting from such an event are tracked as a radiological occurrence. A corrective action plan is prepared for each radiological occurrence by the PRSO and the PM, and submitted to the License RSO and Project QC Manager for review and approval. Radiological occurrences that exceed regulatory limits are reported to the NRC or CDPH within 24 hours of identification as required.

As required by applicable contract, an informational copy of the APTIM-approved corrective action plan is be provided to the Navy. Radiological occurrences are reported in accordance with Subpart M of Title 10 CFR 20.

### 3.2 Radiation Protection Plan Audit

Information regarding the audit and self-assessment program can be found in AMS-710-07-WI-04002, "Radiation Safety Audit Program."



## 4.0 EVALUATION OF POTENTIAL OCCUPATIONAL EXPOSURES

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APTIM is committed to maintaining employee exposures ALARA and ensuring that no regulatory or administrative limits are exceeded. The personnel dosimetry program is used to monitor external occupational doses to its employee and subcontractor radiation workers.

### 4.1 Planned Special Exposures

No planned special exposures are anticipated during this work.

### 4.2 Likely Annual Dose Evaluation

In accordance with 10 CFR 20, occupationally exposed workers who are likely to be exposed to 10 percent or more of applicable regulatory limits are appropriately monitored for exposure to ionizing radiation. For Parcel G, APTIM radiation workers permitted unescorted access to radiologically-controlled areas or performing radiological work tasks, regardless of anticipated exposure, are monitored for exposure to direct ionizing radiation. AMS-710-07-FM-40031, "Radiation Safety Likely Annual Dose Evaluation," is used to evaluate likely annual dose. Appendix C contains the likely annual dose evaluation form.

### 4.3 Administrative Dose Limits

In addition to maintaining exposures ALARA, occupational radiation doses are administratively controlled in a manner that ensures that no worker receives exposure in excess of regulatory limits established in 10 CFR 20. To implement that policy, lower administrative limits have been developed. The administrative exposure occupational limit for Parcel G is established at 10 percent of 10 CFR 20 limits, equal to 500 millirem (mrem)/year total effective dose equivalent.

### 4.4 Declared Pregnant Worker

Workers may declare pregnancy in writing in accordance with AMS-710-01-PR-00200, "Embryo/Fetus Protection Program," and 10 CFR 20. Further guidance on this issue may be found in *Regulatory Guide 8.13, Instruction Concerning Prenatal Radiation Exposure* (NRC, 1999) and *Regulatory Guide 8.29, Instruction Concerning Risks from Occupational Radiation Exposure* (NRC, 1996).

Due to the anticipated low (less than 120 mrem/year; assuming 12 months of data reported at less than the typical detection limit of 10 mrem) whole body annual dose from work activities at Parcel G, it is unlikely that separate or supplemental dose tracking is required. Managing individual exposures to this level meets the NRC requirement of maintaining a dose equivalent of less than 500 mrem and APTIM's administrative limit of 50 mrem to the embryo/fetus during the term of pregnancy of a declared pregnant worker.

## 5.0 CONTROLLING AGENCIES AND LICENSES

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NRC and the State of California issued RMLs to APTIM. The radiation protection program is implemented at Parcel G, HPNS in compliance with a series of license SOPs, procedures, and work instructions. These documents ensure that work activities comply with the license commitments. California Code of Regulations, Title 17, Division 1, Chapter 5, Subchapter 4, is applicable to radiological work performed at Parcel G, HPNS within State of California jurisdiction (2010). A large portion of 10 CFR 20 is incorporated by reference into California Code of Regulations, Title 17.

U.S. Environmental Protection Agency regulations addressed in 40 CFR may also have applicability at Parcel G, HPNS for a variety of regulatory subjects including Comprehensive Environmental Response, Compensation, and Liability Act of 1980; the Resource Conservation and Recovery Act; and the National Emission Standards for Hazardous Air Pollutants.

If more than one company is contracted by the Navy to perform radiological work at Parcel G, a memorandum of understanding (MOU) is prepared and approved by License RSO outlining the responsibilities of each contractor as applicable to their respective scopes of work and RML requirements at HPNS. The MOU is modified as necessary in response to changed conditions.

## 6.0 RADIATION SAFETY TRAINING PROGRAM

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Personnel assigned to one or more Parcel G projects and performing field activities at Parcel G must meet the training requirements of the Site Safety and Health Plan, which is Appendix A to the *Accident Prevention Plan, Radiological Investigation, Survey, and Reporting, Parcel G, Former Hunters Point Naval Shipyard, San Francisco, California* (APP/SSHP; APTIM, 2018c). Workers, including subcontract personnel, who may be exposed to occupational radiation, receive additional training commensurate with the requirements of radiation workers as defined in accordance with AMS-710-07-WI-04005, “Radiation Safety Training,” and project- or site-specific work instructions. Visitors, at a minimum, must receive a site briefing (Section 6.1), complete a “Visitor Access Form,” and be escorted by radiological control personnel anytime they are in a radiologically-controlled area.

Additionally, site radiological workers involved with the transportation of radioactive materials receive task-specific training as required by U.S. Department of Transportation (DOT) regulations (49 CFR 172, Subpart H).

### 6.1 Site Briefing—General Employee Radiation Training

The site briefing is presented to site visitors who may access restricted areas with an escort. The briefing consists of a description of site-specific hazards, locations on site that these visitors are allowed to access, emergency response and evacuation routes, potential exposure to radiation and radioactive material and other applicable information. Visitors must also complete the “Visitor Access Control Form” in accordance with site-specific work instructions. Visitors are prohibited from entering the following areas:

- High Contamination Areas
- Contamination Areas
- Radiation and High Radiation Areas
- Airborne Radioactivity Areas

Access to or generation of Contamination Areas, High Contamination Areas, Radiation/High Radiation Areas, and Airborne Radioactivity Areas is unlikely during this project.

### 6.2 Radiation Worker Training

Site-specific annual radiation worker training is required for individuals who may access radiologically-controlled areas without escort. Radiation worker training contains the following, in addition to the training required by the applicable APP/SSHP (APTIM, 2018c):

- Review of AMS-710-05-PR-01700, “Work Place Hazard Assessment,” for the specific site or task

- Review of the APP/SSHP (APTIM, 2018c)
- Review of this RPP
- Review of the applicable project work plans

Annual radiation worker training is conducted by group briefings, video, and/or printed training material approved by the PRSO. A written examination is given to each radiation worker. Successful completion of radiation training requires a passing grade of 80 percent or higher on the examination.

Training includes the following, at a minimum:

- Principles of ionizing radiation
- Function-specific training in accordance with 49 CFR 172 Subpart H
- Health effects from exposure to radioactive material
- Radiation emissions and associated risks of the types of radioactive material that have been found at Parcel G
- ALARA work principles and techniques, such as methods used to minimize exposure, purposes, and functions of protective devices
- Purpose and proper use of dosimetry
- Storage, transfer, or use of radioactive material
- Radiologically-controlled area restrictions and postings
- Applicable regulations and licenses for the protection of personnel from exposure to radioactive material
- Recognition of site-specific radioactive material and/or radiation-producing devices (e.g., soil, foils, buttons, beads, gauges, fragments, items, low-level radioactive objects)
- Who to contact if radioactive material is found in an area where it is not anticipated
- Who to contact and expected actions in the event of an emergency, breakage, or spill of radioactive material

### 6.3 Radiological Control Technician Training Qualification

The PRSO or designee evaluates and qualifies RCTs for assignment to this project. RCT qualifications are evaluated in accordance with the requirements contained in AMS-710-07-WI-04016, "Qualification of Radiation Safety Workers and Staff," and project- or site-specific work instructions. Project-specific training and evaluation are provided to RCTs commensurate to their assigned duties.

## 7.0 EVALUATION OF PUBLIC DOSE

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Licensed operations are conducted so that the dose limits to individual members of the public are not exceeded, in accordance with Section 1301 of 10 CFR 20.

The PRSO ensures that licensed material is used, transported, stored, and disposed of in such a manner that members of the public do not receive more than 100 mrem total effective dose equivalent in one year. The PRSO also ensures that Controlled Area boundaries are established such that if an individual were present in an unrestricted area, the dose from external sources would not exceed 2 mrem in a one hour period and 100 mrem in one year excluding background; routine surveys are performed to verify this. Public dose excludes doses received from background radiation and from medical procedures. Public dose from external and internal (air effluent) exposure sources is evaluated in accordance with the requirements contained in AMS-710-07-WI-04006, "Evaluation of Public Dose," and 10 CFR 20.1302.

As noted previously, APTIM may perform air sampling at work areas where remediation and materials handling may disturb radioactive contamination. Per Section 1101 of 10 CFR 20, a constraint on air emissions of radioactive material to the environment, excluding radon-222 and its daughters, is established on site, such that members of the public that have the highest possibility for being exposed to potential radiation are not expected to receive a total effective dose equivalent in excess of 10 mrem (0.1 millisievert) per year from these emissions. The applicable RWP evaluates and stipulates air sampling requirements.

The PRSO determines if passive area monitoring dosimetry should be posted at the Controlled Area boundaries of work sites. In general, passive environmental monitoring is employed when the project duration is greater than 90 days. The PRSO periodically reviews the environmental dosimetry results to validate conformance to public dose expectations and reported to the License RSO.

A dose assessment for members of the public is conducted and documented on an annual basis. The assessment incorporates results of radiological surveys, available and applicable air monitoring data, and passive environmental dosimeter readings. The annual public dose assessment demonstrates compliance with regulatory limits and documents actions taken to maintain the dose to the public ALARA.

## 8.0 AS LOW AS REASONABLY ACHIEVABLE PROGRAM

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Elements of a successful ALARA program include the following:

- Management commitment, engineering, and administrative control levels for control of radiation exposure to workers and members of the public
- ALARA goals/radiological performance goals
- ALARA job/experiment planning review
- Records of ALARA program elements

The concept of optimizing protection lends itself to a program with formal elements, plans, and measures that, when implemented, serves to reduce radiation exposures as far below regulatory dose limits as is reasonably achievable. APTIM is committed to conducting operations in a manner that protects the safety and health of workers and the public, minimizes damage or loss to property, and protects the environment. APTIM is further committed to ensuring that potential safety and health risks, such as exposure to ionizing radiation, are reduced to and maintained ALARA.

Pre-work planning is essential to ensuring that radiological work is conducted in a manner that minimizes personnel exposure to ionizing radiation and complies with this ALARA program. Personnel who are experienced and knowledgeable in health physics principles, practices, and procedures and fully understand the scope of work and operations that require handling radioactive material or waste and how these operations affect the potential exposures of personnel to radiation develop the RWP and associated controls.

Assessment of radiological work practices and conditions is necessary to evaluate the efficiency of ALARA actions. At a minimum, radiation surveys to assess radiological conditions in work areas and at publically accessible boundaries (controlled areas) are performed monthly and when changing conditions are identified.

Basic dose reduction strategies are employed using the concepts of time, distance, and shielding to control external exposure and minimize dose. Working efficiently in work area requires advanced planning. Daily pre-job meetings include a review of activities planned and associated hazards and the RWP authorizing work. The RWP specifies the applicable radiological controls, radiological postings, survey requirements, and control limits and necessary hold points, per requirements of applicable site-specific work instruction. Work in radiologically-controlled areas must be performed per the requirements of the applicable RWP.



## 9.0 CONTROL OF RADIOLOGICAL WORK

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Radiological work activities are planned in consultation with the PRSO, PM, and other project personnel. Work instructions providing specific direction for the performance of routine radiological work activities (e.g., radiological surveys, monitoring airborne radioactivity) are prepared as necessary. The PRSO reviews, controls, and issues approved work instructions for use. Radiological control staff are trained to applicable work instructions prior to performing work.

Work in radiologically-controlled areas requires a RWP. Surveys, sampling, establishment of radiological areas, and radiological postings are implemented to define radiological areas and control access to and work in these areas. Access control points are established to provide limited entry points into radiological areas and prevent the inadvertent release of radioactive material or the spread of contamination. Additional access control requirements are specified within AMS-710-07-WI-04015, "Radiological Labeling, Postings, and Access Control."

### 9.1 Radiological Work Permits

Personnel required to enter radiologically-controlled areas enter only in compliance with an approved RWP.

An RCS or designee typically initiates the RWP. The PRSO or designee reviews and approves the RWP. Radiation workers performing work under a job-specific RWP receive an initial briefing on the RWP requirements and limitations prior to performing covered work. The workers and RCTs sign the RWP acknowledging that they have been briefed and have read, understand, and will comply with the RWP requirements. Standing RWPs are used for lower hazard work activities and must also be reviewed, read, understood, and signed by the workers and RCTs. Daily pre-job briefings are not required for standing RWPs. An RWP contains a description of the scope of the task and descriptions of the hazardous conditions in the work area, the dosimetry and PPE requirements, work steps, required surveys, and special precautions. Additional details for writing and approval of an RWP are provided in the AMS-710-07-WI-04009, "Radiological Work Permits."

The RWP has a unique identifier for tracking, a reference to surveys performed that are applicable to the area covered under the RWP, and a list of workers authorized to enter the radiological work area.

Authorization for the job-specific RWP is limited to a specific time period. This time period may be anywhere from one day up to a maximum of one year from the time of issue and an RWP is automatically terminated at the end of that time period. Specific site or area radiological conditions and scope of work are considered when determining the length of authorization. Standing RWPs may be authorized for a period of up to one year. The PRSO or designee may also terminate the RWP.

## 9.2 Task-Specific Work Instructions

Non-routine activities and activities that have greater potential for personnel exposure or the spread of contamination may require the preparation of task-specific work instructions. These work instructions provide the detailed steps for executing the required work. Task-specific work instructions are required for work activities not specifically addressed in this RPP, and for other tasks as determined by the PM, License RSO, PRSO, or the Construction Manager. The PM, PRSO, or designee finalizes, controls, and issues task-specific work instructions for Navy and regulatory review as required.

## 10.0 EXTERNAL EXPOSURE CONTROL AND MONITORING

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External exposure controls and monitoring are performed in accordance with AMS-710-07-WI-04010, "External Exposure Control and Monitoring."

### 10.1 External Exposure Control

External exposures are maintained ALARA (Section 8.0) using the concepts of time, distance, and shielding to control external exposure and minimize dose.

### 10.2 Monitoring and Measuring External Exposure

External monitoring of each qualified radiation worker is accomplished using a thermoluminescent dosimeter provided and analyzed by a National Voluntary Laboratory Accreditation Program dosimetry services provider. The device or method for external monitoring has been selected to ensure that the emissions from the ROCs and potential ROCs at Parcel G are appropriately detected.

As radiological conditions warrant, selected RCTs may be required to wear extremity thermoluminescent dosimeter (finger rings). The use of extremity monitoring is specified in the task RWP.

Assigned dosimeters are exchanged and processed quarterly. Supplemental monitoring, such as self-reading dosimeters, may also be required for a particular work-task. This additional monitoring is specified in the applicable RWP.

## 11.0 INTERNAL EXPOSURE CONTROL AND MONITORING

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Internal exposure controls and monitoring are performed in accordance with AMS-710-07-WI-04011, "Internal Exposure Control and Monitoring." Due to the nature of this project, internal exposure monitoring is not required.

### 11.1 Internal Exposure Control

Internal exposures of radioactive materials are controlled during construction activities by use of dust control and standard exclusion zone practices (e.g., no eating, drinking, smoking within exclusion zones). Internal radiological exposure hazards are not anticipated for work areas where dust controls are applied.

### 11.2 Monitoring and Measuring Internal Exposure

Although not anticipated for the scope of work covered by this RPP, if radiation workers are required to participate in an internal exposure monitoring program, they are required to submit initial bioassay samples prior to initial performance of work in radiologically-controlled areas at the site. Personnel whose estimated intake may exceed 40 derived air concentration-hours are monitored for intake by bioassay. The PRSO may also request a bioassay as necessary for internal dose assessment.

Based upon an evaluation of work activities and surface and soil contamination levels, the PRSO determines the need for air sampling. Whenever air sampling is required, the PRSO, or designee, routinely reviews the sampling data to determine if RWP control limits are adequate. If airborne radioactivity levels reach or exceed RWP control limits, the work is promptly stopped and properly reviewed for additional controls per requirements of site-specific work instructions.

## 12.0 SURVEYS AND MONITORING

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Specific radiological survey and monitoring requirements at Parcel G, HPNS are established in project-specific work plans, task-specific plans, or work instructions. At a minimum, survey frequency and type follow AMS-710-07-WI-40121, "Performing and Documenting Radiation and Contamination Surveys."

### 12.1 Radiological Surveys of Equipment and Materials

Equipment and material released from areas controlled for radiological purposes are surveyed following the methods defined in AMS-710-07-WI-40121. Table 4 provides the criteria for the unconditional release of materials and equipment. In the event that survey results indicate that levels of contamination exceed the limits listed in Table 4, appropriate decontamination methods may be performed to minimize radioactive waste. If decontamination methods are unsuccessful, the material is disposed of as low-level radioactive waste.

### 12.2 Action Levels

Action levels are specific levels of radioactivity used to determine when additional response (e.g., PPE upgrades or changed work techniques) and/or investigation may be necessary. Table 5 lists action levels for radiological controls.

When an action level is exceeded, the measurement is confirmed to ensure that the initial measurement/sample actually exceeds the particular action level. This may involve collecting additional measurements of the same type as the original measurement to confirm the initial result and, as appropriate, to quantify and/or remove the area of elevated residual radioactivity. Modification of action levels requires Navy concurrence.

## 13.0 CONTAMINATION CONTROL

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Site controls and contamination control practices are established to preclude the spread of contamination into uncontrolled areas. It is unlikely that Contamination Areas will be required during this Parcel G fieldwork. A Contamination Area is established and posted, as defined in Section 15.0 and Table 6, if necessary, to locally control known or suspected contamination.

### 13.1 Entry

Entry into a posted Contamination Area requires that the work be performed per an approved RWP, the minimum PPE required by the RWP, and RCT coverage. An RCT may cover his/her own entry into a Contamination Area, but must have a designated support person outside of the Contamination Area who can provide assistance or summon help if necessary.

### 13.2 Exit

Personnel exit a Contamination Area at the designated access control point. An RCT must be present to monitor personnel doffing PPE and exiting the Contamination Area. A whole body frisk is completed after doffing PPE and prior to leaving the access control point.

### 13.3 Limitations on Entry

Personnel with unprotected open wounds or sores do not enter the Contamination Area. If appropriate bandaging is verified, planned work activities are unlikely to compromise the bandaging, and there is no other medical reason to restrict entry, than an exception may be authorized by the PRSO.

Personal clothing beyond what is necessary for modesty is not worn into Contamination Areas. Jewelry and other personal items are not worn or taken into Contamination Areas.

Only tools and materials necessary to accomplish the planned task are allowed into a Contamination Area. Packing and other nonessential materials and items are removed, collected, and properly secured prior to entry.

### 13.4 Control of Items

Equipment, tools, and other items removed from a Contamination Area must meet unconditional release criteria (Table 7) or be managed as radioactive material. If reasonable efforts to decontaminate an item are unsuccessful or impractical, the item is wrapped with plastic sheeting (or equivalent) to prevent the release or spread of contamination, marked to denote the radiological conditions of the item, and properly controlled. Such items may only be moved outside of a Contaminated Area under RCT supervision and control, and may only be stored in a designated Radioactive Materials Area controlled by the PRSO.

## 13.5 Control of High Contamination Areas

Entry into High Contamination Areas may have additional requirements as specified in the RWP, such as extra layers of PPE, face shield, special engineering controls and/or procedures, double step-off-pad for removal of outer layer(s) of PPE, and continuous RCT monitoring. It is unlikely that High Contamination Areas will be required during this Parcel G fieldwork. If necessary, a High Contamination Area is established and posted as defined in Section 15.0 to locally control known or suspected high levels of contamination.

## 14.0 INSTRUMENTATION

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APTIM provides radiation detection and monitoring equipment for use during the Parcel G fieldwork. Project instrumentation has been selected based on its ability to detect the ROCs at the appropriate levels. Details regarding the calibration, operation, and QC requirements for the use of radiation detection and monitoring equipment are in APTIM procedure SPL-SOP-8.10.2, "Radiation Monitoring Instrumentation," and, if necessary, project or site-specific work instructions. The manufacturer or an approved vendor calibrates survey instruments in accordance with the manufacturers' instructions at least annually and after repairs. Replacement of batteries, equivalent cords, and equivalent Mylar windows do not require recalibration unless the instrument fails a response check. Instruments are removed from service on or before calibration expires and sent for recalibration. Table 8 provides a list of typical instruments.



## 15.0 RADIOLOGICAL AREAS AND POSTING

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Boundaries are established to identify and control access to work areas and prevent (to the extent practical) unauthorized access. Additionally, it is meant to protect members of the public from exposure to radiation or radioactive materials as a result of site activities. The required postings and definitions are summarized in Table 6. Additional details, including area de-posting and item labeling, are provided in AMS-710-07-WI-04015 and in project-specific work plans.

## 16.0 RADIATION SAFETY STAFF CREDENTIALS

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The PRSO assesses and documents the training and qualifications of the RCS and RCTs in accordance with AMS-710-07-WI-04016 and site-specific work instructions. The License RSO is responsible for identifying and verifying the qualifications of the PRSO and Alternate PRSO and conducting required license-specific training with the PRSO and with other authorized users.

An American Board of Health Physics Certified Health Physicist in APTIM's Radiological Safety organization is assigned to support the project.

## 17.0 PROCUREMENT, RECEIPT AND INVENTORY

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Receipt of radioactive materials shipments, except exempt-quantity radioactive check sources and the return of samples from an off-site laboratory, are not anticipated for the Parcel G project. Sources and radioactive material samples are controlled, stored, posted, and managed as radioactive material. Specific instructions for these activities are provided in AMS-710-07-WI-04017, "Procurement, Receipt, Transfer, and Inventory of Radioactive Material."

A source storage location at the on-site instrument laboratory consists of a lockable storage cabinet that can be secured inside a lockable room. The PRSO or authorized designee controls the keys or combination to the storage cabinet. When sources are present in the storage cabinet, it is posted as radioactive materials.

An area for the storage and operational checks of radiological monitoring and survey instruments is established in the on-site laboratory and the use of the sources should be restricted to this area. The source storage cabinet remains locked while sources are stored in it and sources are returned to the storage cabinet immediately after use.

Only project personnel trained in the requirements for use and handling of radioactive sources, and authorized in writing by the PRSO, may use sources at a project site. Sources are only used to perform instrument set-ups and daily function tests.

Sources are obtained from either the APTIM Radiological Equipment Group or a vendor approved by the APTIM Quality Services Department. Supplied sources are provided in a storage container and accompanied by a manufacturer's certificate of assay or equivalent that identifies the following information:

- Radionuclide(s)
- Date of manufacture
- Actual measured activity
- Units of activity
- Date of assay if different from date of manufacture
- Manufacturer's name and address

### 17.1 Leak Testing

If required, sources are leak tested prior to initial use on site, every three months for alpha-emitting sources, every six months for beta-gamma emitting sources, and immediately prior to return to the source provider. Leak testing consists of collecting a smear sample collected on the source

(encapsulated sources only) or the source storage container of electroplated sources, and counting the smear. The smear counting instrument is able to detect less than 0.005 microcuries of activity. Results of the leak test are documented as a contamination survey per the requirements of the applicable site-specific work instruction.

Leak test result with detectable activity above twice the area/instrument background is immediately be reported to the PRSO for further evaluation. Sources that are suspected or determined to be leaking are contained in a plastic bag, marked to identify the source as leaking, and segregated. A contamination survey of the storage cabinet, the area where the sources are used, and other potentially affected locations is performed as soon as it is determined that a source is potentially leaking.

Leaking sources are returned to the provider in accordance with their procedures and applicable state and federal transportation regulations.

## **17.2 Transport of Sources**

Radioactive check sources are employed only for the period of time necessary to execute planned work, are not brought to a project location prior to project initiation, and are returned to the provider immediately following the completion of planned field activities.

Radioactive check sources are transported in a APTIM vehicle by an authorized APTIM employee trained in the task-specific functions of (49 CFR 172 Subpart H) and packaged and labeled in accordance with DOT regulations (49 CFR 173, Subpart I). Radioactive check sources are shipped in accordance with DOT regulations.

## **17.3 Reporting Lost, Damaged, or Stolen Sources**

If a source is lost, damaged, or stolen, the discovering individual reports the event immediately to the PRSO. The PRSO immediately notifies the License RSO, who then notifies the PM, the Navy, and other project staff and initiates appropriate actions to control site access and recover a missing or damaged source. If a source is missing, a search by radiological control personnel is initiated. In consultation with the Navy, a report is filed with the appropriate law enforcement agency if it is determined that radioactive material was stolen. The License RSO makes necessary notifications to NRC or CDPH.

## 18.0 SHIPPING AND TRANSPORTATION OF RADIOACTIVE MATERIAL

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A third-party, low-level radioactive waste broker is contracted to the Navy through U.S. Army Joint Munitions Command to provide brokerage services including waste characterization sampling, waste containers, and transportation of radioactive materials/waste generated from this project. An HPNS MOU identifying the protocols for the transfer of radioactive material or radioactive waste from APTIM to the waste broker is executed prior to the initial transfer and remains in force for the duration of this Parcel G project. The MOU is modified as necessary in response to changed conditions.

Environmental samples shipped for off-site analysis and exempt-quantity radioactive check sources are packaged and shipped in accordance with DOT regulations (49 CFR 173, Subpart I) via commercial carriers.

Transport of DOT-regulated radioactive material between Parcel G radiologically restricted areas by APTIM is performed in accordance with the following:

- DOT regulations (49 CFR 173, Subpart I)
- AMS-710-07-WI-40121
- Employees and subcontractors involved in shipment or transportation of radioactive materials have current task-specific training in accordance with the requirements of Subpart H of 49 CFR 172

## 19.0 CONTROL OF RADIOACTIVE WASTE

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Radioactive waste is minimized by compliance with contamination control practices (Section 13.0) combined with segregation and survey practices. A third-party, low-level radioactive waste broker is contracted to the Navy through the U.S. Army Joint Munitions Command to provide brokerage services including providing waste containers and transportation of radioactive materials/waste generated from the Parcel G fieldwork. Contaminated soil and used PPE are placed in bins and the filled bins are transferred to the custody and controls of the waste broker. Discrete objects or sources are stored in a locked area posted as radioactive materials (additional postings may also be necessary), controlled by the PRSO, and are packaged and transferred to the authorized shipper for disposal after completion of the project or sooner to reduce the activity to ensure ALARA exposure to workers and members of the public. Radioactive material are packaged, stored, shipped, and disposed as required by DOT regulations (49 CFR 173, Subpart I).

Work practices are instituted to minimize the generation of liquid waste (wastewater) during work activities. Excavations and sampling locations may fill with water during rainstorms. If dewatering is required, a task-specific work instruction is prepared by APTIM and approved by the Navy to facilitate the process. Excavated saturated soil is transported to a laydown pad to facilitate drying of the soil and removal of contained water by evaporation. Details about the location and construction of laydown pads may be found in the WP (CH2M, 2018). Steps are taken to minimize the impact of equipment and materials-handling activities where water may cause the inadvertent transfer of contamination (e.g., parking contaminated equipment on impacted soil areas awaiting excavation so as to avoid rainfall causing unnecessary contamination of the final grade surface).

Liquid waste originating from a radiological work area is collected in DOT-approved containers, labeled accordingly, radiologically characterized, and then released for reuse/disposal or transferred to a licensed broker, processor, or waste disposal facility for final disposition as waste product.

## 20.0 RADIATION PROTECTION RECORDS

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The PRSO is responsible for ensuring that airborne monitoring, contamination surveys, and exposure/dose rate surveys are reviewed for accuracy and completeness as an on-going process. Individual dosimetry records for personnel are reviewed for positive results. Project personnel exposure records are transmitted quarterly to the APTIM Radiation Safety Records in Concord, California. Positive results must be reported to the License RSO for assessment of the adequacy of field controls and notification provided to the Navy.

Specific information about the format and content of survey and other radiation protection records are detailed in the AMS documents and SOPs listed in Table 2 and project, or site-specific work instructions.

Records relating to radiological characterization, radiation and contamination control (e.g., instrumentation, surveys, logs, and RWPs), training, personnel dose, waste characterization, unconditional release of material and equipment, self-assessments, management reviews, audits, radiological occurrences, corrective actions, and other responses to such findings or incidents are retained by APTIM as part of the official project record. Records are maintained for durations specified by contractual, APTIM, license, and regulatory requirements.

## 21.0 REVIEW AND APPROVAL OF RADIATION PROTECTION PLANS

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The PRSO or designee prepares this RPP, which is reviewed and approved in accordance with AMS-710-07-PR-04000. In addition, the Navy has the opportunity to review, provide input, and indicate acceptance of this RPP. Significant (safety-related) changes to this RPP are reviewed and accepted following the same process.

A review of the entire radiation protection program content and implementation is performed and documented by the License RSO or delegate annually, at a minimum. Project personnel including the PM, PRSO, and on-site personnel support and cooperate with an audit.



## 22.0 REFERENCES

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APTIM Federal Services, LLC (APTIM), 2018a, *Parcel G Removal Site Evaluation Work Plan Addendum, Former Hunters Point Naval Shipyard, San Francisco, California*.

APTIM, 2018b, *APTIM Management System*.

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Arcadis U.S., Inc., 2014, *Final Remedial Action Completion Report, Durable Cover, Groundwater Treatment, and Institutional Controls for Parcel G, Hunters Point Naval Shipyard, San Francisco, California*, March.

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CFR, Title 40, *Protection of Environment*, U.S. Government Printing Office, Washington, D.C., October 13, 2010 <[http://www.access.gpo.gov/nara/cfr/waisidx\\_10/40cfrv1\\_10.html](http://www.access.gpo.gov/nara/cfr/waisidx_10/40cfrv1_10.html)> (August 2011).

CFR, Title 49, Part 172, *Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, Training Requirements, and Security Plans*, Subpart H, Training, U.S. Department of Transportation, U.S. Government Printing Office, Washington, D.C., March 11, 2011 <<http://www.gpoaccess.gov/cfr/index.html>> (August 2011).

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Tetra Tech EC, Inc., 2011, *Final Removal Action Completion Report, Parcel G, Hunters Point Naval Shipyard, San Francisco, California*, December 2.

U.S. Nuclear Regulatory Commission, 1996, *Regulatory Guide 8.29, Instruction Concerning Risks from Occupational Radiation Exposure*, Revision 1, Washington, D.C., February.

U.S. Nuclear Regulatory Commission, 1999, *Regulatory Guide 8.13, Instruction Concerning Prenatal Radiation Exposure*, Revision 3, Washington, D.C., June.

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# Figures

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**Figure 1  
Site Location Map**

**Figure 2  
Parcel G Layout**

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# Tables

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**Table 1**  
**Agency Contact Information**

Contact	Address and Phone Number
U.S. Environmental Protection Agency, Region 9 Attention: Lily Lee	75 Hawthorne Street, SFD-8-3 San Francisco, California 94105 Phone: 415.947.4187
California Department of Public Health Environmental Management Branch, MS 7402 Attention: Sheetal Singh	1616 Capital Avenue PO Box 997377 Sacramento, California 95899 Phone: 916.449.5691
Department of Health Services California Department of Toxic Substances Control Attention: Nina Bacey	700 Heinz Avenue Bldg. F, Suite 200 Berkeley, California 94710 Phone: 510.540.2480
U.S. Department of the Navy BRAC PMO West Lead Remedial Project Manager (RPM) Attention: Danielle Janda	33000 Nixie Way Bldg. 50 San Diego, California 92147 Phone: 619.524.6041
U.S. Department of the Navy BRAC PMO West RPM Attention: Liz Roddy	33000 Nixie Way Bldg. 50 San Diego, California 92147 Phone: 619.524.5755
Naval Sea Systems Command Detachment Radiological Affairs Support Office Attention: Matthew Liscio	160 Main Road Bldg. 1959 Yorktown, Virginia 23691 Phone: 757.887.4354
U.S. Department of the Navy ROICC San Francisco Bay Area Attention: Shirley Ng	950 West Mall Square Bldg. 1, Suite 160 MS2 Alameda, California 94501 Phone: 510.521.8713

*Notes:*

*BRAC PMO*

*Base Realignment and Closure Program Management Office*

*ROICC*

*Resident Officer in Charge of Construction Notes:*

**Table 2**  
**Aptim Federal Services, LLC License Standard Operating Procedures, Procedures, and Work Instructions**

<b>License Standard Operating Procedure Number</b>	<b>License Procedure Title</b>
SPL-SOP-8.10	Radiation Protection Program
SPL-SOP-8.10.2	Radiation Monitoring Instrumentation
SPL-SOP-8.10.6	Safe Handling of Radioactive Materials and Emergency Procedures
AMS-710-07-PR-04000	Radiation Safety Program
<b>Work Instruction Number</b>	<b>Work Instruction Title</b>
AMS-710-07-WI-04000	Self-Assessment of the Radiation Protection Plan
AMS-710-07-WI-04001	Radiation Safety Committee
AMS-710-07-WI-04002	Radiation Safety Audit Program
AMS-710-07-WI-04003	Evaluation of Potential Occupational Exposures
AMS-710-07-WI-04004	Radiation Safety Controlling Agencies and Licenses
AMS-710-07-WI-04005	Radiation Safety Training
AMS-710-07-WI-04006	Evaluation of Public Dose
AMS-710-07-WI-04007	ALARA Program
AMS-710-07-WI-04008	Control of Radiological Work
AMS-710-07-WI-04009	Radiological Work Permits (RWPs)
AMS-710-07-WI-04010	External Exposure Control and Monitoring
AMS-710-07-WI-04011	Internal Exposure Control and Monitoring
AMS-710-07-WI-04012	Radiological Surveys and Monitoring
AMS-710-07-WI-04013	Contamination Control
AMS-710-07-WI-04014	Radiation Detection Instrumentation
AMS-710-07-WI-04015	Radiological Labeling, Postings, and Access Control
AMS-710-07-WI-04016	Qualification of Radiation Safety Workers and Staff
AMS-710-07-WI-04017	Procurement, Receipt, Transfer, Inventory of Radioactive Sources
AMS-710-07-WI-04018	Shipping and Transportation of Radioactive Material
AMS-710-07-WI-04019	Control of Radioactive Waste
AMS-710-07-WI-04020	Radiation Safety Incident Notification and Improvement Reporting
AMS-710-07-WI-04023	Radiological Emergency Response
AMS-710-07-WI-40121	Performing and Documenting Radiation and Contamination Surveys
AMS-710-07-WI-40122	Gamma Walkover Surveys Using a Global Positioning System
AMS-710-07-WI-40123	Sample Collection for Radiological Analysis

**Table 2 (continued)**  
**APTIM Federal Services LLC License Standard Operating Procedures, Procedures, and Work Instructions**

*Notes:*

*License standard operating procedures are applicable to both U.S. Nuclear Regulatory Commission License 20-31340-01 and State of California Radioactive Material License No. 7889-07.*

ALARA                      as low as reasonably achievable

**Table 3**  
**Aptim Federal Services, LLC Key Personnel Responsible for Radiation Protection**

Individual	Project Role	Phone Number	Email
Mark Somerville	License Radiation Safety Officer	925.222.0848	mark.somerville@aptim.com
Ray Schul	Radiological Operations Manager/ Project Radiation Safety Officer	518.496.5533	raymond.schul@aptim.com
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**Table 4**  
**Material and Equipment Free Release Criteria and Thresholds for Use of Administrative or Engineering Controls**

Measured Parameter/ Threshold	Alpha <sup>a</sup> Removable Contamination (dpm/100 cm <sup>2</sup> )	Alpha <sup>a</sup> (Fixed + Removable) Contamination (dpm/100 cm <sup>2</sup> )	Beta/Gamma <sup>a</sup> Removable Contamination (dpm/100 cm <sup>2</sup> )	Beta/Gamma <sup>a</sup> (Fixed + Removable) Contamination (dpm/100 cm <sup>2</sup> )
Free Release <sup>b</sup>	<20	<100	<200/<1,000	<1,000/ <5,000
Administrative Controls Required <sup>c</sup>	≥20	≥100	≥200/≥1,000	≥1,000/≥5,000
Engineering Controls Required <sup>d</sup>	≥2,000	≥10,000	≥4,000/≥20,000	≥20,000/≥100,000

Notes:

<sup>a</sup> Not applicable to volumetric contamination.

<sup>b</sup> Material found to exceed the free release criteria is segregated from material that does not exceed the free release criteria by a Contamination Area boundary.

<sup>c</sup> Minimum administrative controls include establishment of physical boundaries, postings, controls for access and egress, Radiological Work Permits, and the use of personal protective equipment.

<sup>d</sup> Engineering controls supplement administrative controls, are specified in the applicable Radiological Work Permit, and though not required, are applied at lower values.

< less than

≥ greater than or equal to

dpm/100 cm<sup>2</sup> disintegration per minute per 100 square centimeter

**Table 5**  
**Action Levels**

Type	Action Level
Action level for requiring individual monitoring	Greater than 100 mrem Total Effective Dose Equivalent annual expected dose (requires thermoluminescent dosimeter monitoring by license conditions) Site-specific requirement that radiation workers must wear external dosimetry
Action level for requiring decontamination, labeling or storage/disposal as radioactive materials in properly posted radiological area	Greater than Table 4 free release criteria
Action level for RCT assistance, notification of the PRSO, License RSO, PM, and the Navy, and decontamination of personnel	Readings above background levels on personnel
Action level for notification of License RSO, PM, and the Navy, and suspending work in the area until otherwise directed (if an RWP approved by PRSO is not in place)	Exposure rates > 500 microroentgen per hour Occupational airborne radioactivity > 10 percent of 226Ra DAC (3E-11 $\mu\text{Ci/mL}$ ) Site boundary airborne radioactivity > 226Ra AE value (9E-13 $\mu\text{Ci/mL}$ ) Removable surface contamination > 2,000 dpm/100 cm <sup>2</sup> alpha Removable surface contamination > 20,000 dpm/100 cm <sup>2</sup> beta Soil activity concentration exceeds 200 pCi/g 226Ra

Notes:

>	greater than
$\mu\text{Ci/mL}$	microcurie per milliliter
<sup>226</sup> Ra	radium-226
AE	air effluent concentration (10 CFR 20, Appendix B)
DAC	derived air concentration (10 CFR 20, Appendix B)
dpm/100 cm <sup>2</sup>	disintegration per minute per 100 square centimeter
mrem	millirem
Navy	U.S. Department of the Navy
pCi/g	picocurie per gram
PM	Project Manager
PRSO	Project Radiation Safety Officer
RCT	Radiological Control Technician
RSO	Radiation Safety Officer
RWP	Radiological Work Permit

Table 6  
Radiological Area Posting

Area	Definition	Required Posting
Controlled Area	An area, outside of a Restricted Area, but inside the site boundary, access to which can be limited by the licensee for any reason.	CONTROLLED AREA
Restricted Area	An area to which access is limited for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials and to prevent the inadvertent release of radioactive material to the unrestricted areas.	RESTRICTED AREA
Radioactive Materials	An area or room in which there is used or stored an amount of licensed material exceeding 10 times the quantity of such material specified in 10 Code of Federal Regulations 20 Appendix C.	CAUTION, RADIOACTIVE MATERIALS
Radiation Area	Radiation levels could result in an individual receiving a dose equivalent of $\geq 5$ mrem but $< 100$ mrem in one hour at 30 cm.	CAUTION, RADIATION AREA
High Radiation Area	Radiation levels could result in an individual receiving a dose equivalent of $\geq 100$ mrem in one hour at 30 cm.	CAUTION, HIGH RADIATION AREA
Contamination Area	Area accessible to individuals, where surface contamination levels exceed or are likely to exceed the surface contamination values specified in Table 7 (Reg. Guide 1.86), but do not exceed 100 times those values.	CAUTION, CONTAMINATION AREA
High Contamination Area	An area, accessible to individuals, in which surface contamination levels on equipment or solid surface materials are equal to or exceed 100 times the values provided in Table 7 (Regulatory Guide 1.86, Table 1).	CAUTION, HIGH CONTAMINATION AREA
Airborne Radioactivity Area	<p>An area in which airborne radioactive materials, composed wholly or partly of licensed material, exist in concentrations:</p> <ul style="list-style-type: none"> <li>In excess of the DACs specified in Appendix B, to Sections 20.1001-20.2401</li> <li>To such a degree that an individual present in the area without respiratory protective equipment could exceed, during the hours an individual is present in a week, an intake of 0.6 percent of the annual limit on intake or 12 DAC-hours</li> <li>Airborne radioactivity levels <math>\geq 10</math> percent radium-226 DAC (<math>3.0\text{E-}11</math> <math>\mu\text{Ci/mL}</math>)</li> </ul>	CAUTION, AIRBORNE RADIOACTIVITY AREA

Notes:

Reference: U.S. Nuclear Regulatory Guide 1.86, Table 1

Radiological Work Permit sign-in, equipment/materials survey, and personnel frisk not required in areas where radioactive check sources are stored or used.

$\geq$	greater than or equal to
$<$	less than
$\mu\text{Ci/mL}$	microcurie per milliliter
cm	centimeter
DAC	derived air concentration
mrem	millirem

**Table 7**  
**Regulatory Guide 1.86 (Table 1)**  
**(U.S. Atomic Energy Commission, 1974)**

Radionuclide <sup>a</sup>	Disintegrations/minute/100-square-centimeters (dpm/100 cm <sup>2</sup> )		
	Average <sup>b c f</sup>	Maximum <sup>b d f</sup>	Removable <sup>b e</sup>
U-nat, 235U, 238U and associated decay products	5,000 ( $\alpha$ )	15,000 ( $\alpha$ )	1,000 ( $\alpha$ )
Transuranics, 226Ra, 228Ra, 230Th, 228Th, 231Pa, 227Ac, 125I, 129I	100	200	20
Th-nat, 232Th, 90Sr, 223Ra, 224Ra, 232U, 126I, 131I, 133I	1,000	3,000	200
$\beta$ - $\gamma$ emitters (nuclides with decay modes other than $\alpha$ -emissions of SF) except 90Sr and others noted above.	5,000 ( $\beta$ - $\gamma$ )	15,000 ( $\beta$ - $\gamma$ )	1,000 ( $\beta$ - $\gamma$ )

**Notes:**

U.S. Atomic Energy Commission, 1974, Termination of Operating Licenses for Nuclear Reactors, Regulatory Guide 1.86, Washington D.C.

<sup>a</sup> Where surface contamination by both  $\alpha$ - and  $\beta$ - $\gamma$ -emitting nuclides exists, the limits established for  $\alpha$ - and  $\beta$ - $\gamma$ -emitting nuclides should apply independently. [The values apply to radioactive contamination deposited on, but not incorporated into the interior of, the contaminated item.]

<sup>b</sup> As used in this table, dpm means the rate of emission by radioactive material as determined by correcting the counts per minute observed by the appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

<sup>c</sup> Measurements of average contamination should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

<sup>d</sup> The maximum contamination level applies to an area of not more than 100 cm<sup>2</sup>.

<sup>e</sup> The amount of removable radioactive material per 100 cm<sup>2</sup> of surface area should be determined by wiping that area with dry filter or soft absorbent material, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. [The use of dry material may not be appropriate for tritium.] When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire area should be wiped. [Except for transuranics and 226Ra, 227Ac, 230Th, 228Th, 231Pa, and  $\alpha$ -emitters, it is not necessary to use wiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination (i.e., removable and fixed) are within the limits for removable contamination.]

<sup>f</sup> [The average and maximum radiation levels associated with surface contamination resulting from  $\beta$ - $\gamma$ -emitting nuclides should not exceed 0.2 mrad/hr @ 1 cm and 1.0 mrad/hr @ 1 cm, respectively, measured through 7 milligrams per square centimeter (mg/cm<sup>2</sup>) of total absorber.]

Note: Comments in brackets [ ] have been added by APTIM.

**Table 8**  
**Instrumentation for Radiological Surveys**

Measurement/ Technique for Emission	Primary Use	Type of Instrumentation	
		Detector Type, Make, and Model Number	Meter Description, Make, and Model Number
Static/Scan Alpha/Beta	Equipment, material, debris, and personnel	Gas-flow proportional Ludlum Model 43-68 (126 cm <sup>2</sup> )	Alpha/beta dual channel Ludlum Model 2360
Static/Scan Alpha/Beta	Surface soil	Alpha/beta scintillation Ludlum Model 43-93 (100 cm <sup>2</sup> )	Alpha/beta dual channel Ludlum Model 2360
Static/Scan Gamma	Surface soil	Gamma scintillation Ludlum Model 44-10, 2-inch by 2-inch NaI	Scaler/ratemeter data logger Ludlum Model 2221
Static/Scan Gamma	Surface soil	Gamma scintillation Ludlum Model 44-20, 3-inch by 3-inch NaI	Scaler/ratemeter data logger Ludlum Model 2350
Static/Scan Gamma	Surface soil	Gamma scintillation RSX-1 256 cubic inch NaI detectors	RSI RS-700 multi-channel analyzer
Exposure Rates Gamma	Contact and general area dose rates ( $\mu$ R/hr)	Gamma scintillation 1-inch by 1-inch NaI	MicroR meter Ludlum Model 19
Exposure Rates Gamma	Contact and general area exposure rates mR/h, $\mu$ R/h	Ion chamber	Ludlum Model 9
Sample Counting/ Alpha/Beta	Smears and air filters	Alpha/beta scintillation	Sample Counter Ludlum Model 2929 or 3030

*Notes:*

$\mu$ R/hr	<i>microrentgen per hour</i>
cm <sup>2</sup>	<i>square centimeters</i>
mR/h	<i>milliroentgen per hour</i>
NaI	<i>sodium iodide</i>

# **Appendix A**

## **U.S. Nuclear Regulatory Commission and State of California Radioactive Materials Licenses**

# **Appendix B**

## **Radiation Protection Plan Acknowledgement Form**

## Radiation Protection Plan Acknowledgement Form

I have reviewed, understand, and agree to follow the Radiation Protection Plan for the Radiological Investigation, Survey, and Reporting, Parcel G, Former Hunters Point Naval Shipyard, San Francisco, California. Additionally, I understand that there are additional non-radiological health and safety requirements, which are presented in the Accident Prevention Plan/Site Health and Safety Plan. I agree to abide by the requirements of the Radiation Protection Plan for the work that I will perform.

[illegible]



# **Appendix C**

## **Likely Annual Radiation Dose Evaluation Form**